

What is Claimed:

1 1. A method for processing source data for transmission over a
2 wideband signal such that the wideband signal has reduced discrete power spectral density
3 (PSD) components, the wideband signal including wideband signal pulses, the method
4 comprising the steps of:

5 generating data symbols responsive to the source data;

6 transforming one or more of the data symbols into a frame including one or
7 more orthogonal frequency division multiplexing (OFDM) symbols;

8 selectively inverting the frame of OFDM symbols responsive to a random
9 data sequence; and

10 modulating the wideband signal pulses of the wideband signal with the
11 selectively inverted frame of OFDM symbols.

1 2. The method of claim 1, wherein the source data includes bits and the
2 generating step comprises the step of:

3 mapping bits of the source data to the data symbols using one of (i) binary
4 phase shift keying and (ii) quadrature phase shift keying.

1 3. The method of claim 1, wherein the data symbols are in a frequency
2 domain and wherein the transforming step comprises the step of:

3 transforming the one or more data symbols from the frequency domain to a
4 time domain to produce the frame including the OFDM symbols.

1 4. The method of claim 1, further comprising the step of:

2 scrambling the source data prior to the generating step.

1 5. The method of claim 4, wherein the scrambling step comprises the
2 step of:

3 scrambling the source data using a linear feedback scheme initialized using
4 substantially uncorrelated seeds

1 6. The method of claim 1, wherein the selectively inverting step
2 comprises the steps of:

3 selectively inverting one or more individual OFDM symbols within the frame
4 responsive to the random data sequence.

1 7. The method of claim 1, wherein the wideband signal is an ultra
2 wideband signal including ultra wideband signal pulses and wherein the modulating step
3 comprises the step of:

4 modulating the ultra wideband signal pulses of the ultra wideband signal
5 with the selectively inverted frame of OFDM symbols.

1 8. The method of claim 1, wherein the wideband signal is a multi-band
2 wideband signal including wideband signal pulses and wherein the modulating step
3 comprises the step of:

4 modulating the wideband signal pulses corresponding to at least one sub-
5 band of the multi-band wideband signal with the selectively inverted frame of OFDM
6 symbols.

1 9. An apparatus for processing source data for transmission over a
2 wideband signal such that the wideband signal has reduced discrete power spectral density
3 (PSD) components, the wideband signal including wideband signal pulses, the apparatus
4 comprising:

5 a mapper configured to generate data symbols responsive to the source
6 data;

7 a transformer coupled to the mapper, the transformer configured to
8 transform one or more data symbols into a frame including one or more orthogonal
9 frequency division multiplexing (OFDM) symbols;

10 an inverter coupled to the transformer, the inverter configured to selectively
11 invert the frame of OFDM symbols; and

12 a wideband transmitter coupled to the inverter, the wideband transmitter
13 configured to modulate the wideband signal pulses of the wideband signal with the
14 selectively inverted frame of OFDM symbols.

1 10. The apparatus of claim 9, further comprising:

2 a scrambler coupled to the mapper, the scrambler configured to scramble
3 the source data prior to mapping the source data to the data symbols.

1 11. The apparatus of claim 10, wherein the scrambler comprises:

2 a linear feedback shift register configured for initialization using seed values;
3 and

4 a memory coupled to the linear feedback shift register, the memory
5 including a set of seed values for initializing the linear feedback shift register wherein the
6 seed values are substantially uncorrelated with respect to one another.

1 12. The apparatus of claim 9, wherein the wideband transmitter is a
2 multi-band wideband transmitter.

1 13. The apparatus of claim 9, wherein the wideband transmitter is an
2 ultra wideband transmitter.

1 14. The apparatus of claim 9, wherein the data symbols are in a
2 frequency domain and the transformer is configured to transform the data symbols from
3 the frequency domain into the frame of OFDM symbols in a time domain.

4 15. The apparatus of claim 9, wherein the inverter is configured to
5 selectively invert one or more individual OFDM symbols within the frame.

1 16. A method for processing a received wideband signal having reduced
2 discrete power spectral density (PSD) components to recover source data, the wideband
3 signal including a selectively inverted frame inverted using a random data sequence, the

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4 frame including one or more orthogonal frequency division multiplexing (OFDM) symbols,
5 the method comprising the steps of:

6 de-modulating the wideband signal to recover the selectively inverted frame
7 of OFDM symbols;

8 selectively inverting the frame responsive to the random data sequence to
9 recover an original frame of OFDM symbols;

10 transforming the original frame of OFDM symbols into one or more data
11 symbols; and

12 generating the source data responsive to the one or more data symbols.

1 17. The method of claim 16, wherein the original frame is in a time
2 domain and wherein the transforming step comprises the step of:

3 transforming the original frame of OFDM symbols from the time domain to
4 the frequency domain to produce the one or more data symbols.

1 18. The method of claim 16, wherein the source data is scrambled and
2 wherein the method further comprising the step of:

3 descrambling the source data.

1 19. The method of claim 16, wherein the wideband signal is an ultra
2 wideband signal and wherein the de-modulating step comprises the step of:

3 de-modulating the ultra wideband signal to recover the selectively inverted
4 frame of OFDM symbols.

1 20. The method of claim 16, wherein the wideband signal is a multi-band
2 wideband signal and wherein the modulating step comprises the step of:

3 de-modulating the multi-band wideband signal to recover the selectively
4 inverted frame of OFDM symbols.

1 21. An apparatus for processing a received wideband signal having
2 reduced discrete power spectral density (PSD) components to recover source data, the
3 wideband signal including a selectively inverted frame inverted using a random data
4 sequence, the frame including one or more orthogonal frequency division multiplexing
5 (OFDM) symbols, the apparatus comprising:

6 a wideband receiver configured to de-modulate the wideband signal to
7 recover the selectively inverted frame of OFDM symbols;

8 an inverter coupled to the wideband receiver, the inverter configured to
9 selectively invert the recovered selectively inverted frame of OFDM symbols using the
10 random data sequence to recover an original frame of OFDM symbols;

11 a transformer coupled to the inverter, the transformer configured to
12 transform the original frame of OFDM symbols into one or more data symbols; and

13 a mapper coupled to the transformer, the mapper configured to generate the
14 source data responsive to the one or more data symbols.

1 22. The apparatus of claim 21, wherein the source data is scrambled and
2 wherein the apparatus further comprises:

3 a de-scrambler coupled to the mapper, the de-scrambler configured to de-
4 scramble the source data.

1 23. The apparatus of claim 21, wherein the wideband receiver is a multi-
2 band wideband receiver.

1 24. The apparatus of claim 21, wherein the wideband receiver is an ultra
2 wideband receiver.

1 25. The apparatus of claim 21, wherein the original frame is in a time
2 domain and the transformer is configured to transform the original frame of OFDM symbols
3 from the time domain into the one or more data symbols in a frequency domain.

1 26. A system for processing source data for transmission over a wideband
2 signal such that the wideband signal has reduced discrete power spectral density (PSD)
3 components, the wideband signal including wideband signal pulses, the system
4 comprising:

5 means for generating data symbols responsive to the source data;

6 means for transforming one or more of the data symbols into a frame
7 including one or more orthogonal frequency division multiplexing (OFDM) symbols;

8 means for selectively inverting the frame of OFDM symbols responsive to a
9 random data sequence; and

10 means for modulating the wideband signal pulses of the wideband signal
11 with the selectively inverted frame of OFDM symbol.

1 27. The system of claim 26, further comprising:

2 means for scrambling the source data prior to the generating step.

1 28. A computer readable carrier including software that is configured to
2 control a computer to implement a wideband signal processing method embodied in a
3 computer readable medium for processing source data for transmission over a wideband
4 signal such that the wideband signal has reduced discrete power spectral density (PSD)
5 components, the wideband signal including wideband signal pulses, the processing method
6 including the steps of:

7 generating data symbols responsive to the source data;

8 transforming one or more of the data symbols into a frame including one or
9 more orthogonal frequency division multiplexing (OFDM) symbols;

10 selectively inverting the frame of OFDM symbols responsive to a random
11 data sequence; and

12 modulating the wideband signal pulses of the wideband signal with the
13 selectively inverted frame of OFDM symbols.

1 29. The computer readable carrier of claim 28, wherein the method
2 implemented by the computer further includes the steps of:

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scrambling the source data prior to the generating step.